



## United States Department of the Interior

FISH AND WILDLIFE SERVICE  
San Francisco Bay-Delta Fish and Wildlife Office  
650 Capitol Mall, Suite 8-300  
Sacramento, California 95814



In reply refer to:  
08FBDT00-2019-TA-0074

FEB 13 2019

Mr. David Smith  
Water Quality Assessment Section Chief  
U. S. Environmental Protection Agency, Region IX  
75 Hawthorne Street  
San Francisco, California 94105

Subject: Information Request and Non-Concurrence for the Section 7 Consultation for U. S. Environmental Protection Agency Region 9's Approval of Water Quality Objectives for Dissolved Oxygen in Suisun Marsh

Dear Mr. Smith:

This letter is in response to the U. S. Environmental Protection Agency Region 9's (EPA) December 7, 2018, letter requesting consultation with the U.S. Fish and Wildlife Service (Service) on their determination on possible effects of their approval of the San Francisco Bay Regional Water Quality Control Board (Regional Board) amendment to the Water Quality Control Plan for the San Francisco Basin to establish site-specific water quality standards for dissolved oxygen (DO) in Suisun Marsh. Your letter was received by the Service on December 13, 2018. This document is issued under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act).

Your consultation initiation letter included the determination that your approval of the water quality standards may affect but not adversely affect threatened or endangered species and referred to the letter's enclosed Biological Evaluation (BE). The BE provided not likely to adversely affect determinations for the endangered California freshwater shrimp (*Syncaris pacifica*), endangered Conservancy fairy shrimp (*Branchinecta conservatio*), threatened vernal pool fairy shrimp (*Branchinecta lynchi*), threatened vernal pool tadpole shrimp (*Lepidurus packardii*), endangered California clapper rail (*Rallus longirostris obsoletus*), endangered California least tern (*Sterna antillarum browni*), threatened western snowy plover (*Charadrius nivosus nivosus*), threatened Central California Distinct Population Segment of the California tiger salamander (*Ambystoma californiense*) (California tiger salamander), threatened California red-legged frog (*Rana draytonii*), threatened Alameda whipsnake (*Masticophis lateralis euryxanthus*), threatened giant garter snake (*Thamnophis gigas*), the endangered salt marsh harvest mouse (*Reithrodontomys raviventris*), and the threatened delta smelt (*Hypomesus transpacificus*) and its critical habitat.

In email communications between the Service and EPA, it was determined that the DO criteria apply only to the salt water channels and sloughs of Suisun Marsh and will replace the current DO saltwater criteria, which apply to waters east of the Carquinez Strait through Suisun Bay and as such, vernal pools do not apply and would not affect vernal pool species. This reasoning applies to all species in this consultation that do not occur in salt water channels or sloughs in

Suisun Marsh: California freshwater shrimp, Conservancy fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, California tiger salamander, California red-legged frog, Alameda whipsnake, and the giant garter snake. The Service is also not aware of any occurrences of western snowy plovers in Suisun Marsh. The Service recommends that EPA determine that this approval of water quality standards will not affect these species. With this determination, section 7 consultation is not necessary for these species.

The Effects of the Action sections of the BE for the California clapper rail, California least tern, and salt marsh harvest mouse are sparse and the Service cannot ascertain the “may affect” portion of the determination. Please provide an analysis that describes the potential for effects and how those effects are discountable, insignificant, or completely beneficial. If EPA is unable to determine a potential effect, the more appropriate determination would be “no effect” which does not require consultation.

The Service does not concur that EPA’s action is not likely to adversely affect the delta smelt or its critical habitat. EPA relied on out-of-date information for delta smelt resulting in incorrect assumptions and conclusions and does not comport with current multi-agency efforts to improve habitat for delta smelt in Suisun Marsh.

Scientific understanding of delta smelt biology has improved significantly in the last 10 years. In addition, the citation on p. 27 of the BE referencing DO and salinity needs for larval smelt to “Brown and Kimmerer, 2002” is an inappropriate citation and not supported by other sources. This citation refers to a report from a 2002 CALFED workshop. See [http://www.calwater.ca.gov/science/pdf/2002\\_Delta\\_Smelt\\_Workshop\\_Summary.pdf](http://www.calwater.ca.gov/science/pdf/2002_Delta_Smelt_Workshop_Summary.pdf).

The portion of that report containing the DO and salinity needs in the CALFED report is from “Appendix D: A Suggested Strategy for Delta Smelt Research.” This appendix to the report was “handed out at the workshop [by a consulting firm] but not discussed and the proposal has not been reviewed by the delta smelt study team” (Brown and Kimmerer 2002; p. 1).

The link between water temperature and dissolved oxygen is important in the development of DO criteria for fishes. Scientific understanding of smelt thermal tolerance has also improved in the last 10 years. Delta smelt are sensitive to warm temperatures with thermal stress (sublethal critical thresholds) beginning at 4-6 °C below their critical thermal maximum ( $CT_{max}$ ) around 25.4 °C ( $\pm 1.7$ ) (Moyle *et al.* 2016; Komoroske *et al.* 2014; Komoroske *et al.* 2015; Swanson *et al.* 2000). The  $CT_{max}$  is the temperature at which the fish experiences a loss of equilibrium and is ecologically dead. Delta smelt are unable to compensate for thermal stress, meaning short-term exposure to stressful conditions can lead to chronic stress (Komoroske *et al.* 2015).

Peer-reviewed publications on optimum oxygen concentrations or oxygen tolerance are not available for delta smelt. The Service relies on information provided by UC Davis’ Fish Conservation and Culture Laboratory (FCCL) which currently cultures delta smelt for scientific research and maintains a refuge population. FCCL is the established expert on conditions needed to keep smelt alive. FCCL has observed that even at optimal rearing temperatures, when DO is around 70%, they start to swim to the water surface and the gills open rapidly. That means that well-fed, healthy fish in culture show physiological stress at 70% saturation. Enough stress to come to the surface to breathe, a behavior that is precarious for a forage fish because it attracts predators. The FCCL cultures fish at 16 °C, pH 7.5-8, and DO 85% saturation and above (Dr. Tien-Chieh Hung, pers comm).

Based on the information from FCCL we can estimate the following oxygen needs from the table below.

Water temperature (°C)	Oxygen at 100% saturation (mg/L)*	Oxygen concentration at 70% Saturation (mg/L)
15	10	7
20	9	6.3
25**	8.3	5.8

\*Calculated from the USGS Dissolved Oxygen tables (<https://water.usgs.gov/software/DOTABLES/>)

\*\*It is important to note that wild fish who are susceptible to predation, food limitation and disease may not survive the combination of higher water temperatures (25 °C) and low dissolved oxygen.

Based on the ecology of Suisun Marsh we would expect dissolved oxygen to be lowest when temperatures are the highest and when high biological oxygen demand water is being released from managed wetlands. Both conditions would occur in the late summer or fall when juvenile rearing delta smelt are present in larger channels of the Marsh, including Denverton, Nurse and Montezuma Sloughs. Federal management efforts to increase the use of these sloughs by delta smelt are in the late planning stages. Delta smelt can move to more favorable oxygen conditions but at a metabolic cost and increased predation risk.

The Service would not consider either the acute or chronic criteria protective of delta smelt year-round. A 24-hours DO of 4.0 mg/L will result in physiological stress and behavioral alterations resulting in harm or lethal "take" under the Act, and therefore the proposed project is "likely to adversely affect" delta smelt.

Suisun Marsh is within critical habitat for delta smelt, and where Primary Constituent Elements (PCEs) are present (water depth, flow, velocity, salinity, turbidity), oxygen conditions should be supportive of all life stages year-round and not result in adverse effects. A chronic DO of 5.0 mg/L would not be adequate for recruitment or growth. The proposed criteria may be appropriate for smaller sloughs within the marsh network which do not possess all the delta smelt critical habitat PCEs. For the larger channels of the marsh, which possess all the delta smelt critical habitat PCE's, the current standard of 7 mg/L minimum is adequately protective.

The Service looks forward to assisting EPA with the consultation and DO standards in the Suisun Marsh. If you have any questions regarding this response, please contact Kim Squires, Section 7 Division Chief, via email at [Kim\\_Squires@fws.gov](mailto:Kim_Squires@fws.gov). Please refer to Service file number 08FBDT00-2019-TA-0074 in any future correspondence regarding this project.

Sincerely,



Jana Affonso  
Assistant Field Supervisor

### References

- Brown, R. and W.J. Kimmerer. 2002. Delta Smelt and CALFED's Environmental Water Account: A Summary of the 2002 Delta Smelt Workshop. CALFED Science Program, Sacramento, CA.
- Komoroske, L. M., Connon, R. E., Jeffries, K. M., & Fanguie, N. A. (2015). Linking transcriptional responses to organismal tolerance reveals mechanisms of thermal sensitivity in a mesothermal endangered fish. *Molecular ecology* 24(19):4960-4981.
- Komoroske, L. M., Connon, R. E., Lindberg, J., Cheng, B. S., Castillo, G., Hasenbein, M., & Fanguie, N. A. 2014. Ontogeny influences sensitivity to climate change stressors in an endangered fish. *Conservation physiology* 2(1).
- Moyle, P. B., Brown, L. R., Durand, J. R., & Hobbs, J. A. 2016. Delta smelt: life history and decline of a once-abundant species in the San Francisco Estuary. *San Francisco Estuary and Watershed Science* 14(2).
- Swanson, C., T. Reid, P. S. Young and J. J. Cech. 2000. Comparative environmental tolerances of threatened delta smelt (*Hypomesus transpacificus*) and introduced wakasagi (*H. nipponensis*) in an altered California estuary. *Oecologia* 123: 384-390.